various embodiments, modulator **107** suitably applies the signals to the appropriate electrodes **112**A-D via any drive circuitry **109**, which includes any sort of scaling amplifier, multiplexer, switch to any current or voltage source, charge transfer device, controlled impedance, and/or the like. Although FIG. **1** shows a single driver circuit **109** interconnecting modulator **107** and sensing region **101** in a serial fashion, in practice drive circuitry **109** will typically include multiple amplifiers, multiple drivers and/or other signal paths providing parallel connections between modulator **107** and the various electrodes **112** within sensing region **101** to permit multiple sensing channels **113** to be driven by modulated electrodes **112** simultaneously with the same or different signals.

[0030] As noted above, modulation signals **110**A-D are provided to electrodes **112**A-D in sensing region **101**, and resultant signals **116** from receiving electrode **114** are provided to a suitable demodulator **117**. A scaling amplifier, multiplexer, filter, discriminator, comparator, and/or other receiving circuitry **115** may be provided as well to shape received signals **116**. Demodulator **117** is any circuit or other module capable of demodulating the output **116** of sensing region **101** to identify any electrical effects produced by object **121**. Demodulator **117** may also include and/or communicate with a demodulation filter, such as any suitable digital or analog low-pass or band-pass filter, as well as any conventional analog-to-digital converter (ADC). In various embodiments, demodulator **117** receives carrier signal **111** and/or the phase shifted versions of the distinct digital codes **106** to allow demodulation of both signals. Alternatively, demodulator **117** provides analog demodulation of carrier signal **111** and provides the resultant signals to controller **102** and/or receiving circuitry **115** for subsequent processing. Similarly, the demodulation function represented by module **117** in FIG. **1** may be logically provided in hardware, software, firmware and/or the like within controller **102** and/or another component, thereby removing the need for a separately-identifiable demodulation circuit **117**.

[0031] During the operation of sensor **100**, any number of distinct digital codes are produced by code generation module **104** and modulated with a carrier frequency to create a set of modulation signals **112**A-D applied to any number of electrodes **112**A-D within sensing region **101**. The position of object **121** with respect to sensing region **101** electrically affects one or more output signals **116** provided from sensing region **101**. By demodulating the resultant signals **116**, the electrical effects can be identified and subsequently processed by controller **102** or the like to determine a position-based attribute relating to object **121**. By modulating the electrodes with an appropriate digital code, the narrower sensing frequency for the sensor is effectively spread across multiple frequencies, thereby improving noise rejection. Moreover, the use of code division multiplexing allows each of the modulation signals **110**A-D to be applied simultaneously, thereby reducing or eliminating the need for separate time domain switching and control in many embodiments. The electrical effects identified from sensing region **101** using spread spectrum techniques may be further processed by controller **102** and/or another processing device as appropriate.

[0032] With reference now to FIG. **2**, an exemplary process **200** for detecting a position-based attribute of an object with respect to a sensing region **101** suitably includes the broad steps of producing a set of distinct digital codes for modulation signals **110**A-D (step **201**), demodulating each of the response signals **116** that result from the application of modulation signals **110**A-D (steps **204**, **206**), and determining one or more position-based attributes of object **121** from the electrical effects identified within the response signals **116** (step **208**). In various further embodiments, the particular digital codes generated in step **202** may be modified (step **210**) to reduce the effects of noise, reducing interference on other devices caused by this device, or for any other purpose. Additional processing may also be performed (step **212**), such as single or multi-object processing, rejection of undesired image data, and/or the like.

[0033] Although flowchart shown in FIG. **2** is intended to show the various logical steps included in an exemplary process **200** rather than a literal software implementation, some or all of the steps in process **200** may be stored in memory **103** and executed by controller **102** alone and/or in conjunction with other components of sensor **100** (e.g. code generation module **104**, modulator **107**, demodulator **117** and/or the like). The various steps may be alternately stored within any digital storage medium, including any digital memory, transportable media (e.g. compact disk, floppy disk, portable memory and/or the like), magnetic or optical media, and/or the like. The various steps of process **200** may be applied in any temporal order, or may be otherwise altered in any manner across a wide array of alternate embodiments. Further, the various steps shown in FIG. **2** could be combined or otherwise differently organized in any manner.

[0034] As noted above, the distinct digital codes **106** used to create modulation signals **110**A-D may be produced in any manner (step **201**), such as by any type of hardware or software logic represented by code generation module **104** in FIG. **1**. Any number of feedback shift registers, for example, can be configured in a maximum length sequence (MLS) or the like to generate a pseudo-random digital code of any desired length that could be readily applied in a variety of phases and/or sums as distinct code sequences to the various modulation signals **110**A-D. The resulting sequence of binary codes **106** emanating from parallel shift registers is generally spectrally flat, with the exception of a minimal DC term. In an alternate embodiment, a MLS or other routine for generating digital codes **106** may be simulated in software executing within controller **102**, or elsewhere as appropriate. In still other embodiments, codes **106** are generated prior to use and stored in a lookup table or other data structure in memory **103**, or the like. In various alternate but equivalent embodiments, controller **102** may directly generate or retrieve codes **106** and/or may produce them by directing the operation of a separate code generation module **104** or the like. As noted above, the particular codes may be generated in any manner. A digital bit sequence may be simply shifted in phase, for example, to create multiple distinct codes. Alternatively, distinct codes can be computed from other codes using a variety of methods including summation, exclusive-or, and multiplication, and/or other techniques of generating high dimensionality random and pseudo-random sequences. Code generation techniques based upon exclusive-or or multiplication operations may provide an additional benefit of generating linear combinations that may be useful in some embodiments.